

Operational Range Assessment Program (ORAP) Phase II Overview

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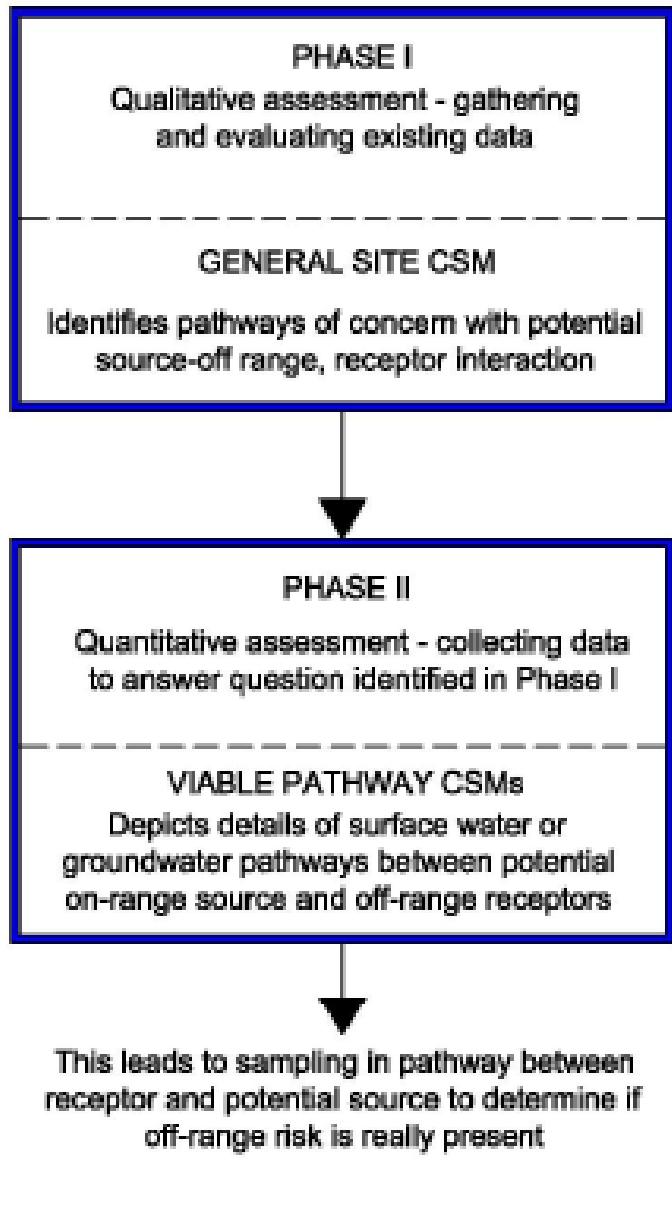
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Operational Range Assessment Program

Background

- Mission
 - Establish “information excellence” to support the Army’s Range Sustainment Program.
- Intent
 - Keep ranges open and available for testing and training.
 - Ensure people on and off Army installations are not drinking water contaminated by explosives.
 - Address regulatory and public concerns.





ORAP Assessments
use a phased
approach and are
based on
Source – Receptor
Interactions



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Phase II Quantitative Assessment

- U.S. Army Public Health Command (Provisional) Phase II Approach
 - Develop installation-specific HSP and APPs
 - Develop DQOs
 - Develop QAPPs using UFP-QAPP
 - Identify and address applicable SW and GW pathways only
 - Develop detailed Viable Pathway CSMs (discussion and illustration)
 - Incorporate non-range influences and degradation
 - Select effective sample locations
 - GW sampling at/near sources (not on impact areas) or exposure points
 - SW sampling
 - Account for temporal variability (wet/dry seasons, high/low flow events)
 - Use SW decision flow chart



Phase II Quantitative Assessment

- USAPHC (Provisional) Phase II Approach (continued)
 - Ecological Risk Assessments – aquatic receptors only
 - Background and 95% UCL of mean results vs. screening levels comparison
 - Benthic macroinvertebrate surveys – false Positive / Negative
 - Human Health Risk Evaluations
 - Initial data screening – direct comparison to screening levels
 - Quantitative data screening – determine need for HHRA
 - Referred categorization must be based on Risk Assessment results – not just on Phase II data



Phase II ORAP

- ACSIM has overall Army responsibility for Operational Range Assessment Program including funding and guidance.
- G3 provides HQDA level operator input.
- AEC and NGB are the Program Managers for Phase II Assessments.
- USAPHC (Provisional) will provide technical oversight and QA.
- Contract mechanism for Phase II Assessments will consist of AE IDQ, Multiple Award Military Munitions, and Multiple Award Environmental Service contracts.
- Total number of Active and Reserve installations requiring a Phase II is 45 including the seven (7) pilot studies.
- Phase II completion date is 2014.



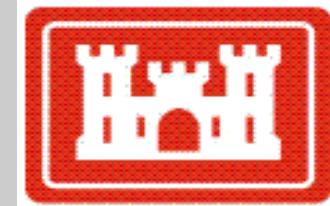
ORAP Phase II Pilot

USAG Fort Jackson / McCrady Training Center

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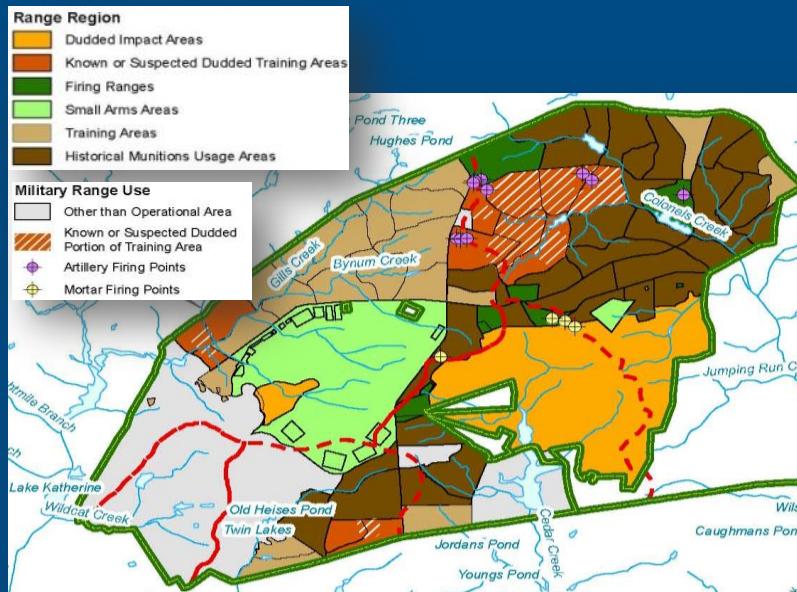


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Installation Overview / Fast Facts

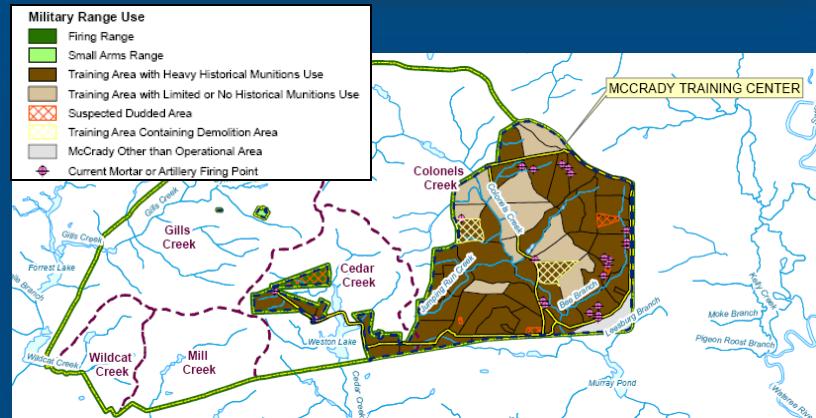
■ Fort Jackson -

- Army owned/operated 36,971 acres (+15,267 acres operated by SCARNG)
- Used 1917 to present for Basic & Advanced Infantry Training
- 29,475 operational acres / 16,471 categorized as Inconclusive*
- 104 operational ranges / 51 categorized as Inconclusive



■ McCrady Training Center -

- Army owned/NGB operated
- 15,267 acres in total
- Used by SCARNG since 1943
- 14,895 operational acres / 12,243 categorized as Inconclusive*
- 62 operational ranges / 48 categorized as Inconclusive*



* Inconclusive – Existing information is either insufficient to make a source-receptor interaction determination or indicates a potential for such interaction to be occurring.

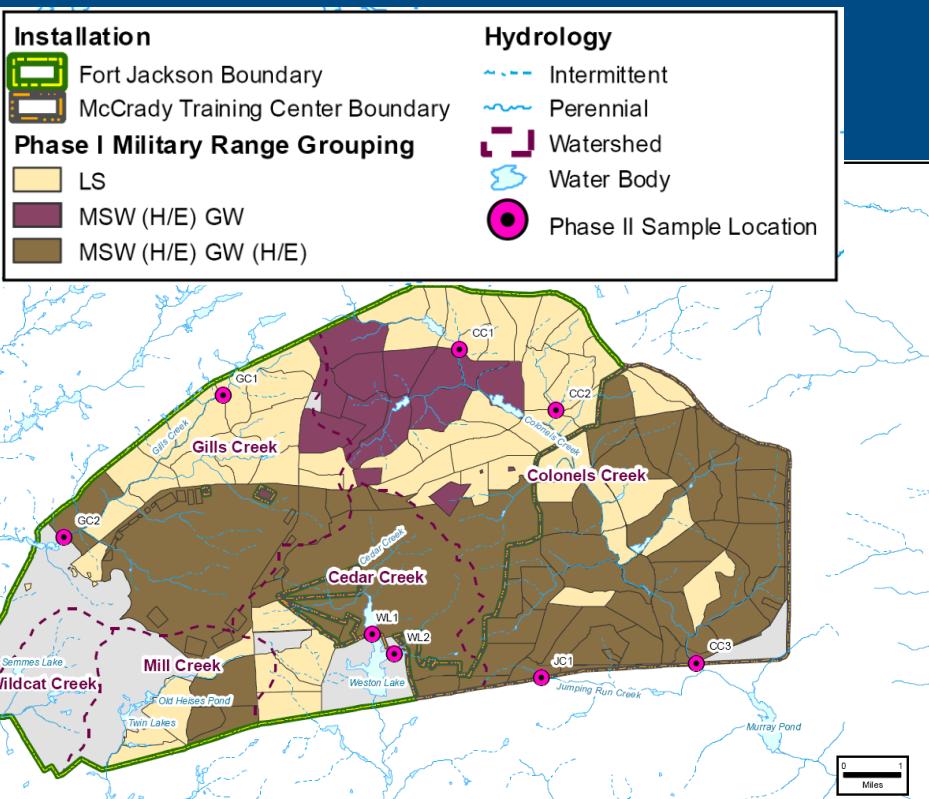
Surface Water System Study Overview

■ Watersheds

- Gills Creek
- Colonels Creek
- Cedar Creek
- Mill Creek *

■ Sampling Events

- Wet Season A + B – April Storm - May
- Dry Season A + B - July



■ Surface Water Analysis

- Explosives by EPA 8095M
- Dissolved Metals by EPA 1638M
- Perchlorate by EPA 6850

■ Sediment Analysis

- Explosives by EPA 8330A
- Metals by 6020A

■ Benthic Macroinvertebrates

- Explosives by EPA 8330A
- Metals by 6020A

Surface Water System Study Results

Colonels Creek

■ Surface Water MCOC

- Antimony, lead, and zinc exceeded reference
- None exceeded PAL at 95% UCL of mean

■ Sediment MCOC

- Copper, lead, and zinc exceeded reference
- None exceeded PAL at 95% UCL of mean

■ Benthic Macroinvertebrates

- No indications of impairments

Surface Water and Sediment MCOC
Antimony
Copper
Lead
Tungsten
Zinc
1,3,5-Trinitrobenzene
1,3-Dinitrobenzene
2,4,6-Trinitrotoluene
2,4-Dinitrotoluene
2,6-Dinitrotoluene
2-Amino-4,6-Dinitrotoluene
3,4-Dinitrotoluene (SW Only)
4-Amino-2,6-Dinitrotoluene
4-Nitroaniline (SD Only)
HMX
m-Nitrotoluene
Nitrobenzene
Nitroglycerine
o-Nitrotoluene
Perchlorate (SW Only)
p-Nitrotoluene
RDX
Tetryl

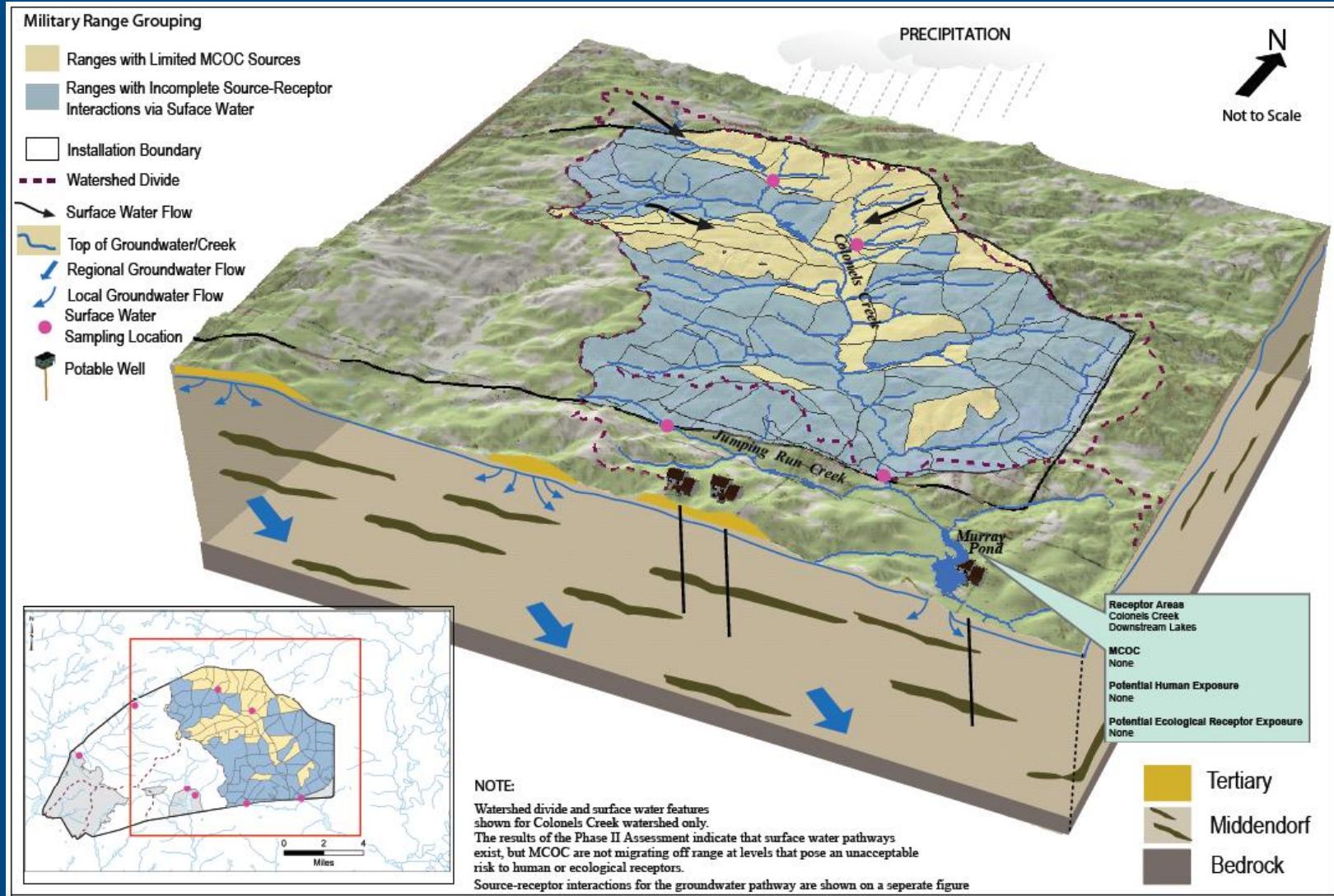
MCOC Exceeding Reference
Surface Water
Antimony
Lead
Zinc
Sediment
Copper
Lead
Zinc

MCOC Exceeding Project Action Levels at 95% UCL of the mean
Surface Water
None
Sediment
None



Surface Water System Study Findings

Colonels Creek Conceptual Site Model



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Groundwater System Study Overview

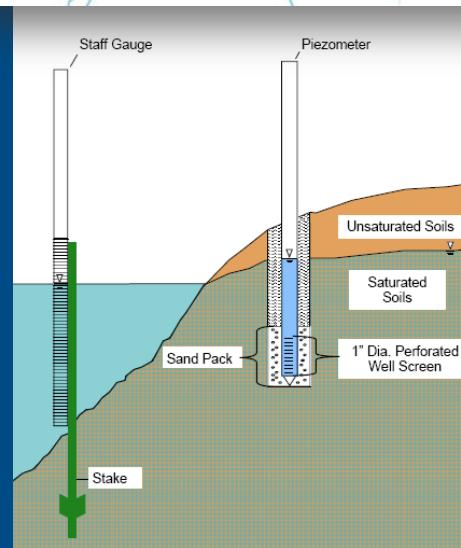
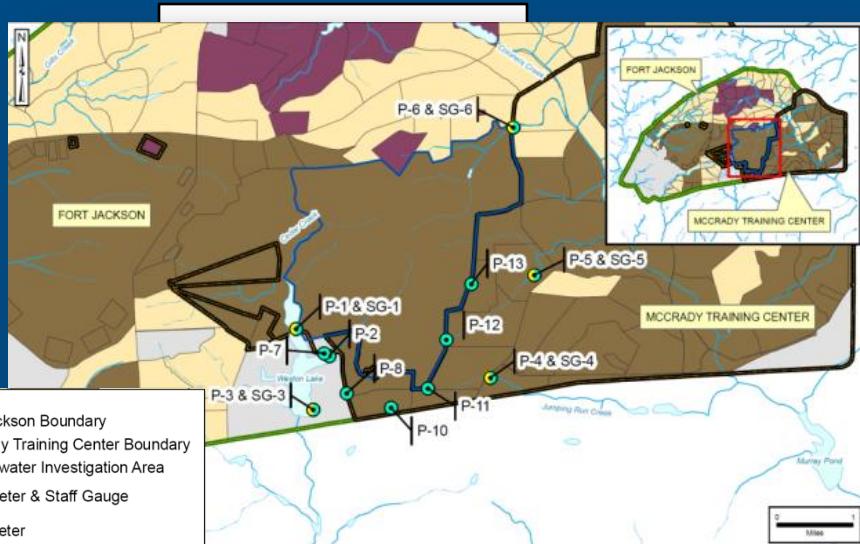
- Worst-Case Groundwater Investigation Area (Blue Outline)

- Worst-Case based on munitions type and loading, & proximity to receptors

- 2 Stages

- Stage I (30 March – 20 May 2009):

- 7 Piezometers
 - 5 staff gauge / piezometer pairs
 - Groundwater elevation measurement



Groundwater System Study Overview

■ Stage II (27 May – 10 June 2009)

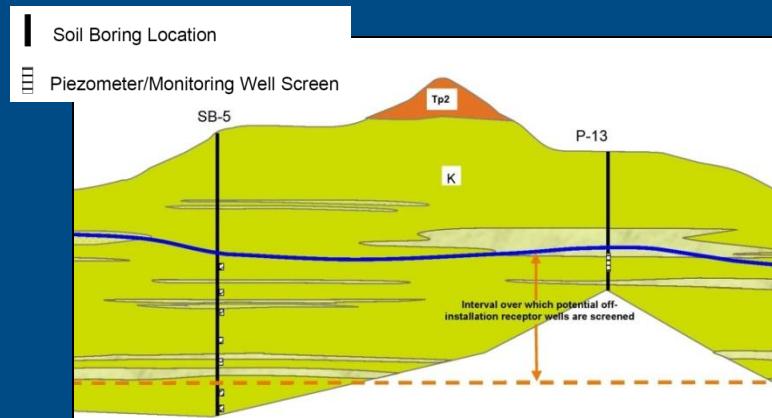
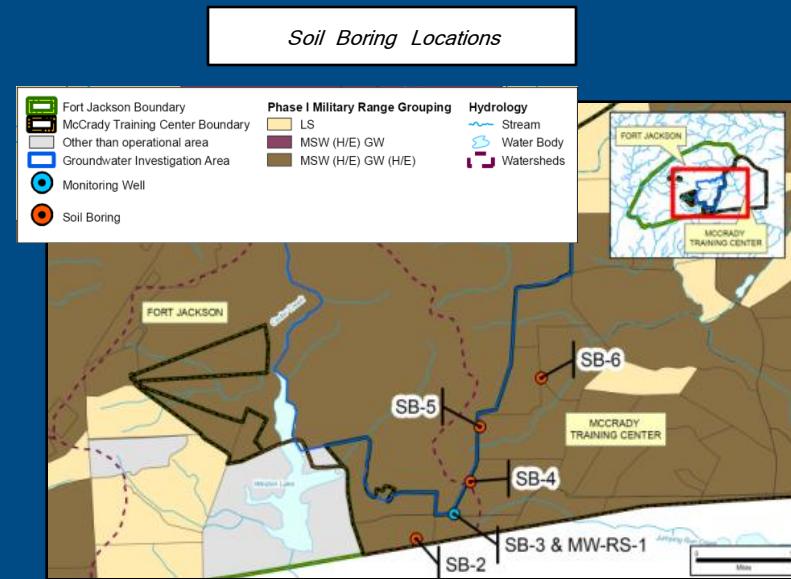
- 5 Soil Borings and 1 Deep Monitoring Well
- 26 depth-discrete groundwater samples
- 20-foot intervals to approximately 150 feet AMSL
- One existing supply well sampled
- Analyses

MCOC

- Explosives by EPA 8095M
- Perchlorate by EPA 6850
- Total and dissolved metals (antimony, copper, lead, zinc, and tungsten) by EPA 200.8

Water Quality

- Hardness metals (calcium and magnesium) plus sodium by EPA E200.7
- Anions (sulfate, chloride, and nitrate) by EPA 300.0
- Alkalinity by EPA 310.1/SM2320B
- Total dissolved solids (TDS) by SM2450C



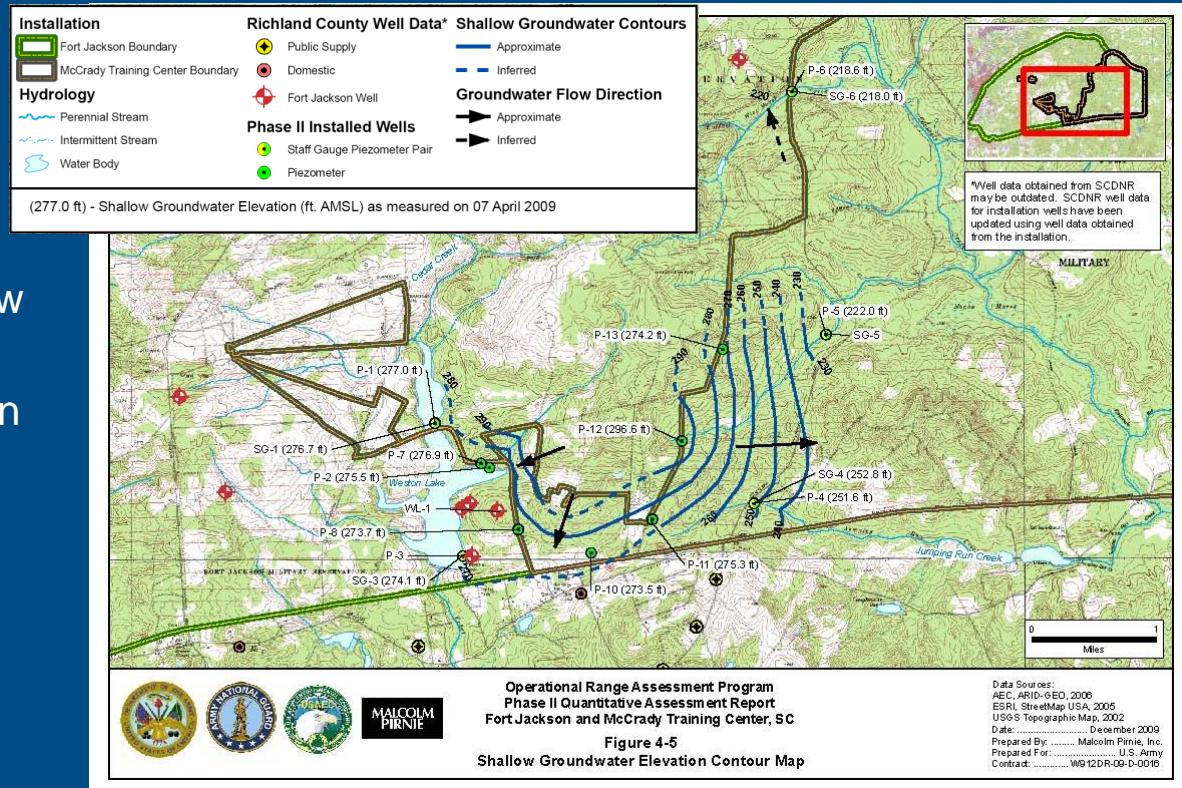
Groundwater System Results

Geology

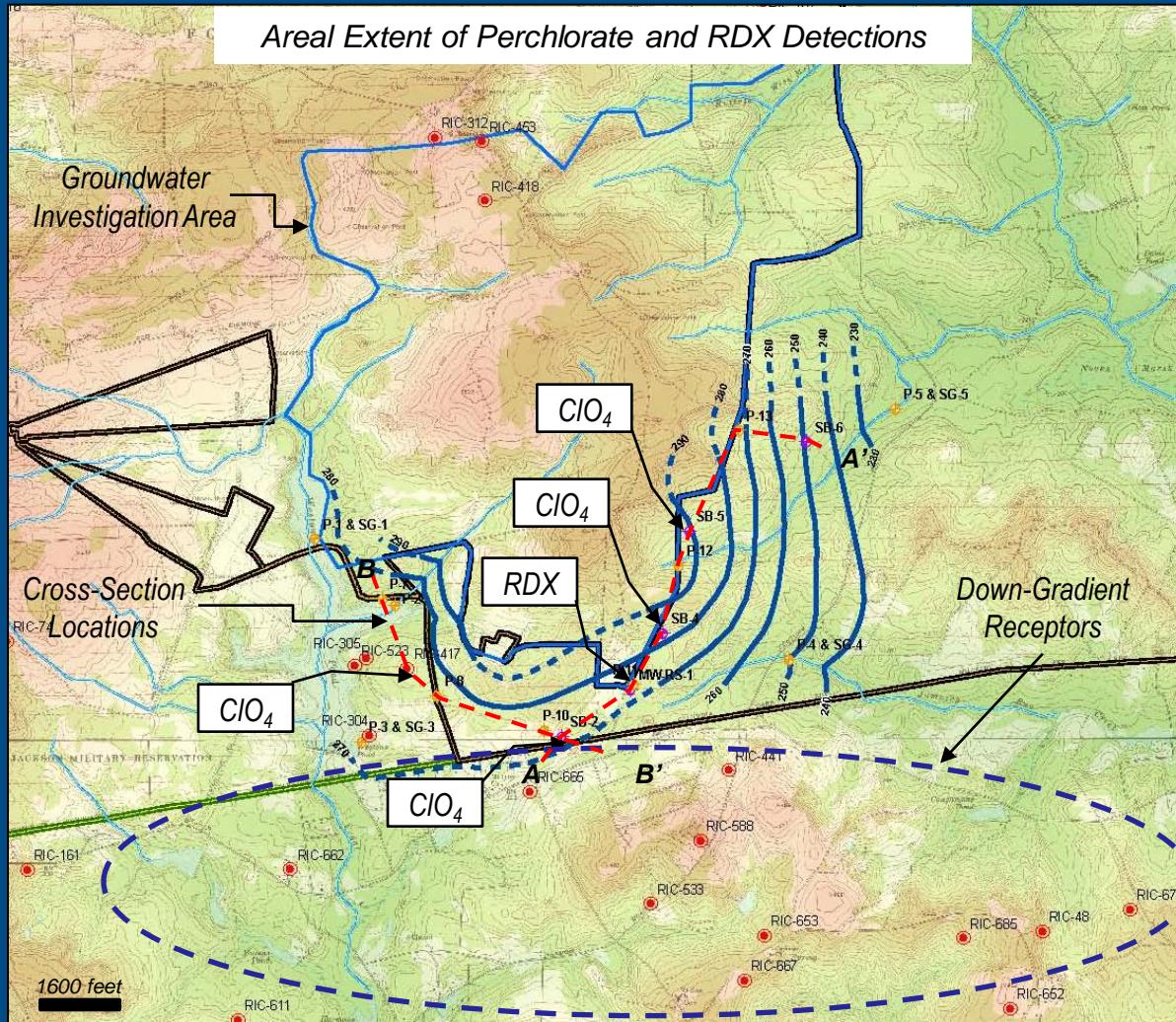
- Predominantly sand (fine- to medium-grained, sub-angular quartz, micaceous zones)
- Frequent clay units, laterally discontinuous upper, potentially continuous lower clay unit present in all 5 soil borings

Shallow Groundwater Flow

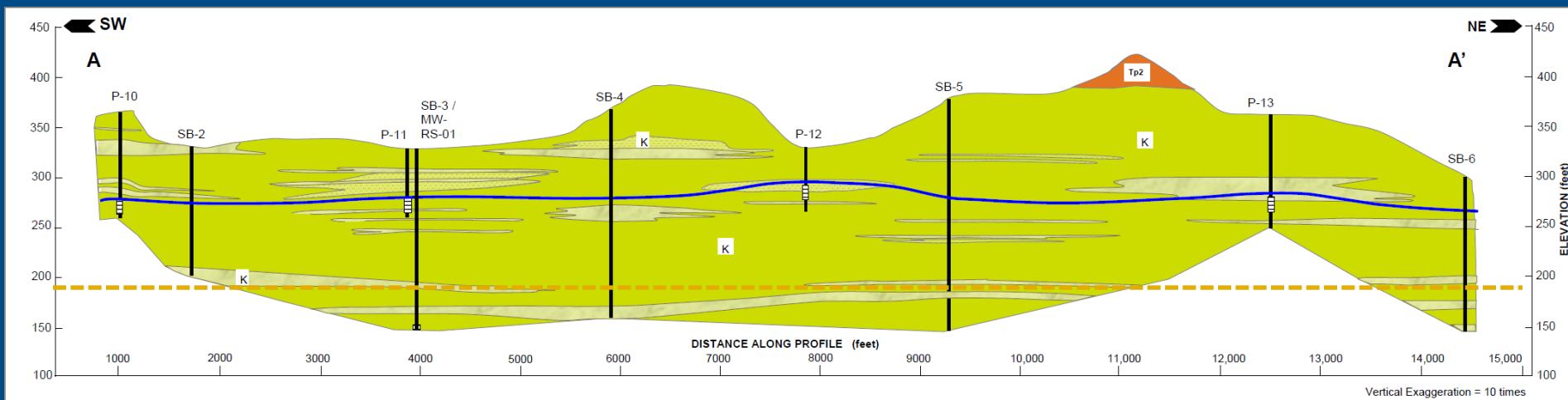
- Topography controlled flow
- Radial flow west, south, and east from investigation area
- Discharge of shallow groundwater to low order streams (Cedar Creek, Colonels Creek, Jumping Run Creek)



Groundwater System Results

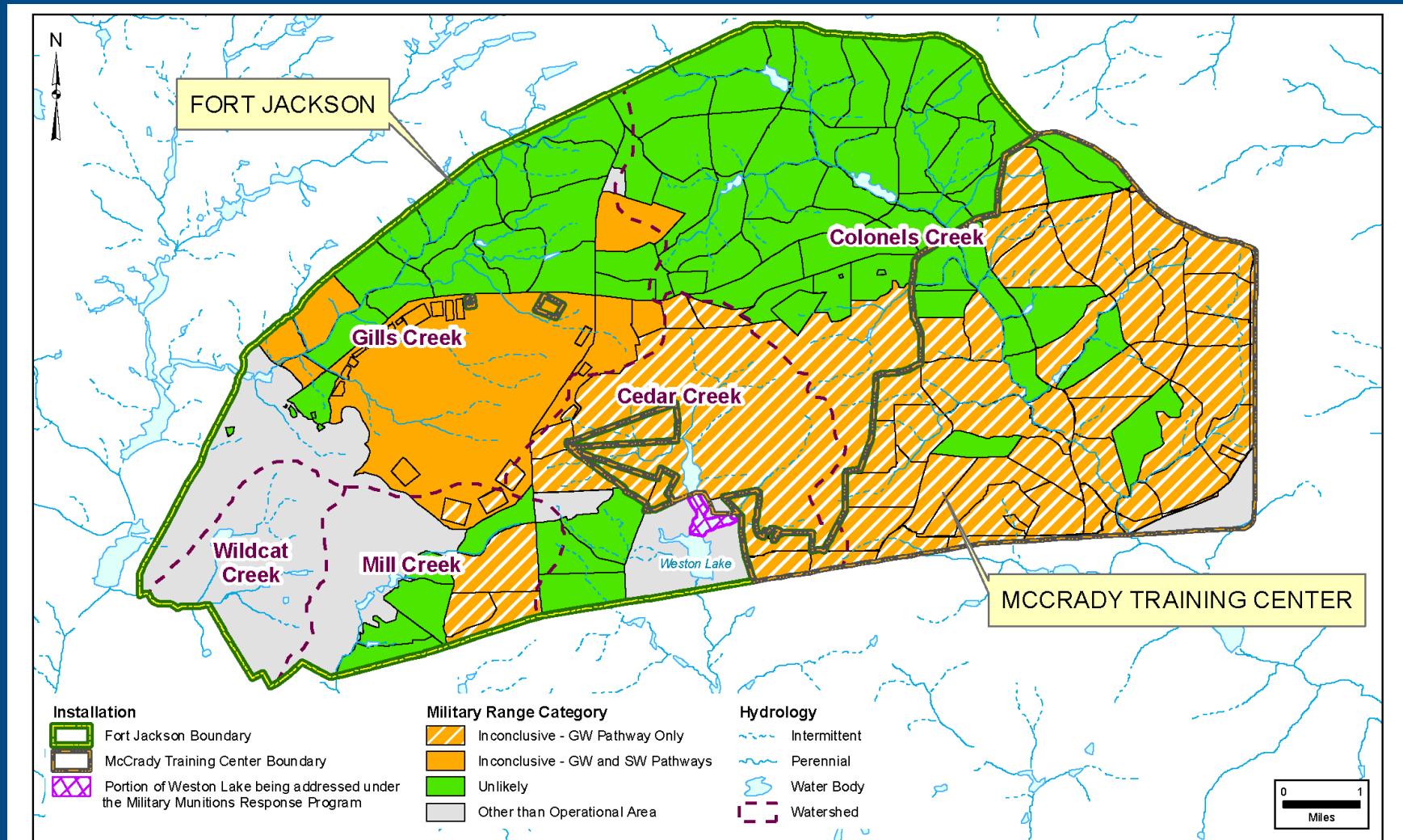


Groundwater System Results



- **RDX:**
 - 29 Samples Collected
 - 3 Detections in soil boring SB-3
 - 0.064 µg/L to 0.17 µg/L
 - All < PAL (6.1 µg/L) but 2 above LRU (0.1 µg/L)
- **Perchlorate:**
 - 29 Samples Collected
 - 7 Detections in 3 soil borings (SB-2, SB-4, and SB-5), and Weston Lake Well
 - 0.11 µg/L to 0.21 µg/L
 - All < PAL (15 µg/L) and <LRU (9 µg/L)

Overall Phase II Recommendations – Fort Jackson/McCrady Training Center



Phase II Recommendations



ORAP Phase II Pilot

Fort A.P. Hill

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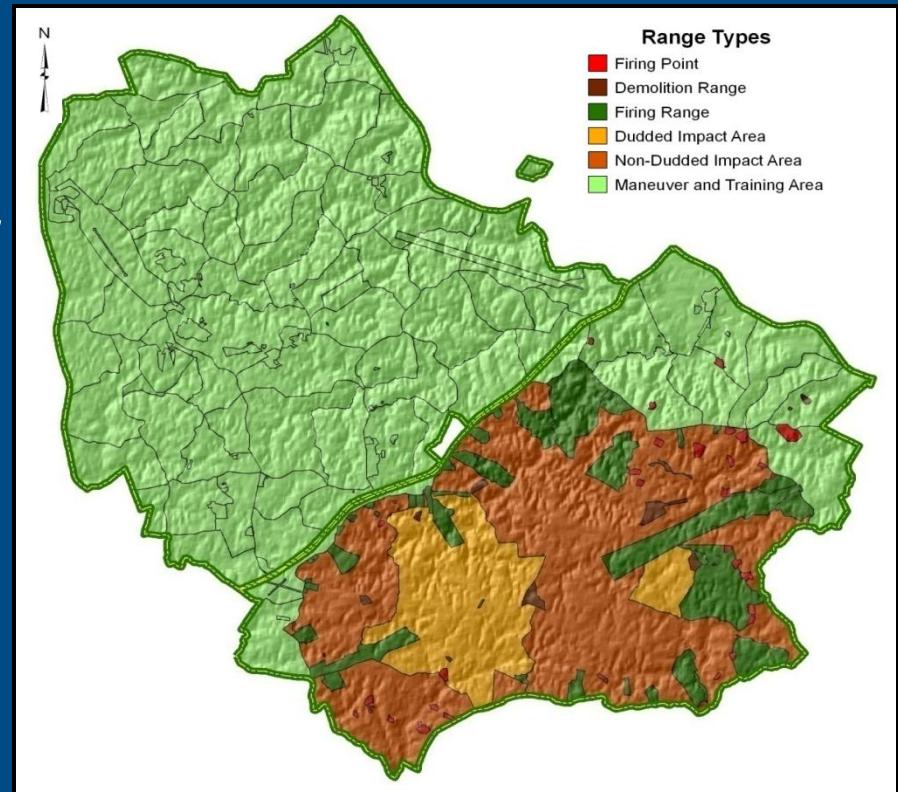


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Installation Overview / Fast Facts

Fort A.P. Hill, Virginia

- *U.S. Army owned/operated*
- *Active since 1941*
- *228 operational ranges*
- *74,262 acres*



Phase I Conclusions

- *Unlikely* – 128 operational ranges, 47,641 acres
- *Inconclusive* - (insufficient info regarding off range source-receptor interaction) 100 operational ranges, 26,621 acres



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Piloting the Protocol

- The identified sources, pathways, and receptors at installation allow full implementation of Technical Protocol
 - Training history means typical programmatic constituents potentially present on site
 - Main programmatic transport pathways identified from multiple source types
 - Well defined surface water flow and discharge points for multi-seasonal sampling
 - Groundwater sampling at both source discharge and potential exposure points
 - Habitat conditions present for testing application of benthic macroinvertebrate dip net sampling
- Site location allows comparisons of protocol application between Fort A.P. Hill and USAPHC pilot site in Virginia
- Site is easily accessible for evaluation by USAEC, USAPHC, and USACE program managers and technical oversight



Surface Water System Approach

- Worst Case Approach - Heaviest Usage
- Multi-Seasonal Sampling Events
- Five Representative Watersheds
- Weight of Evidence Evaluation



Composite
Sediment
Samples

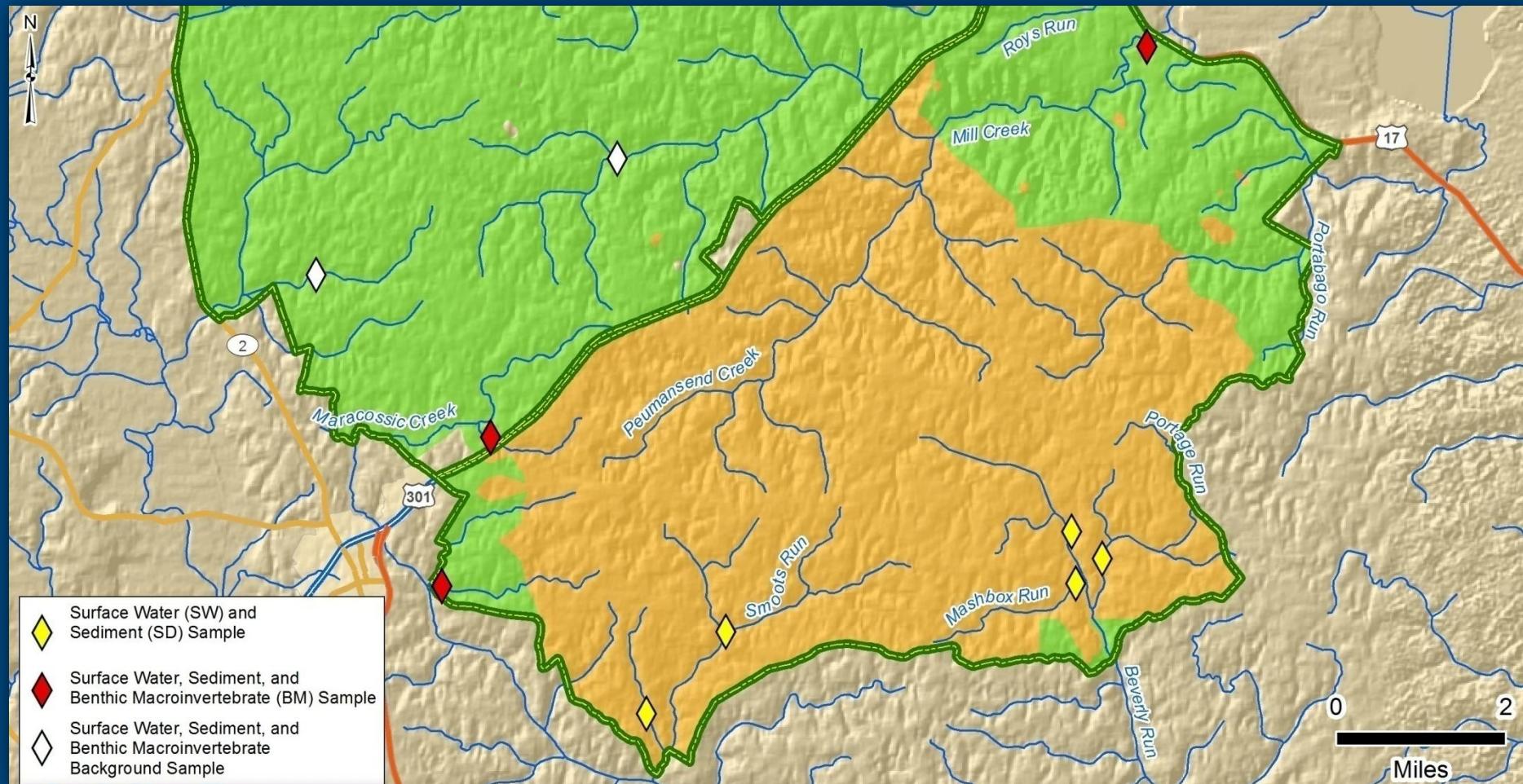


BMI Composite Samples



Composite Surface
Water Samples

Surface Water System Approach



Installation Data	Range Category	Transportation	Hydrology
Installation Boundary	Unlikely	Interstate	Rivers and Streams
	Inconclusive	Highway	
		Major Road	



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Surface Water System Results

Surface Water - 95 UCLM for all analytes below background and/or human and ecological screening criteria at range/installation boundary

Sediment - All analytes below background and/or ecological screening criteria at range/installation boundary.

Benthic -Diverse, optimal habitats identified - no statistical difference versus background – critters are just fine

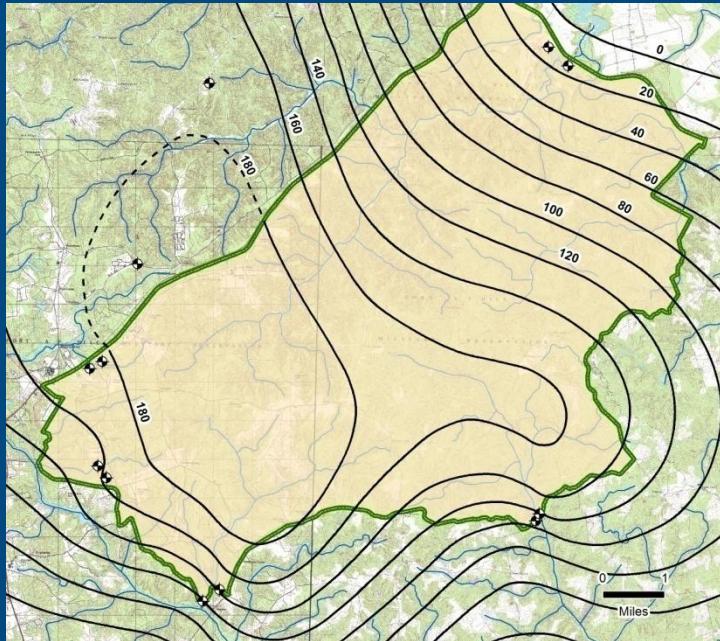


Recent training below sampling locations adds new source component
Currently revising technical approach to evaluate new source



Groundwater Approach

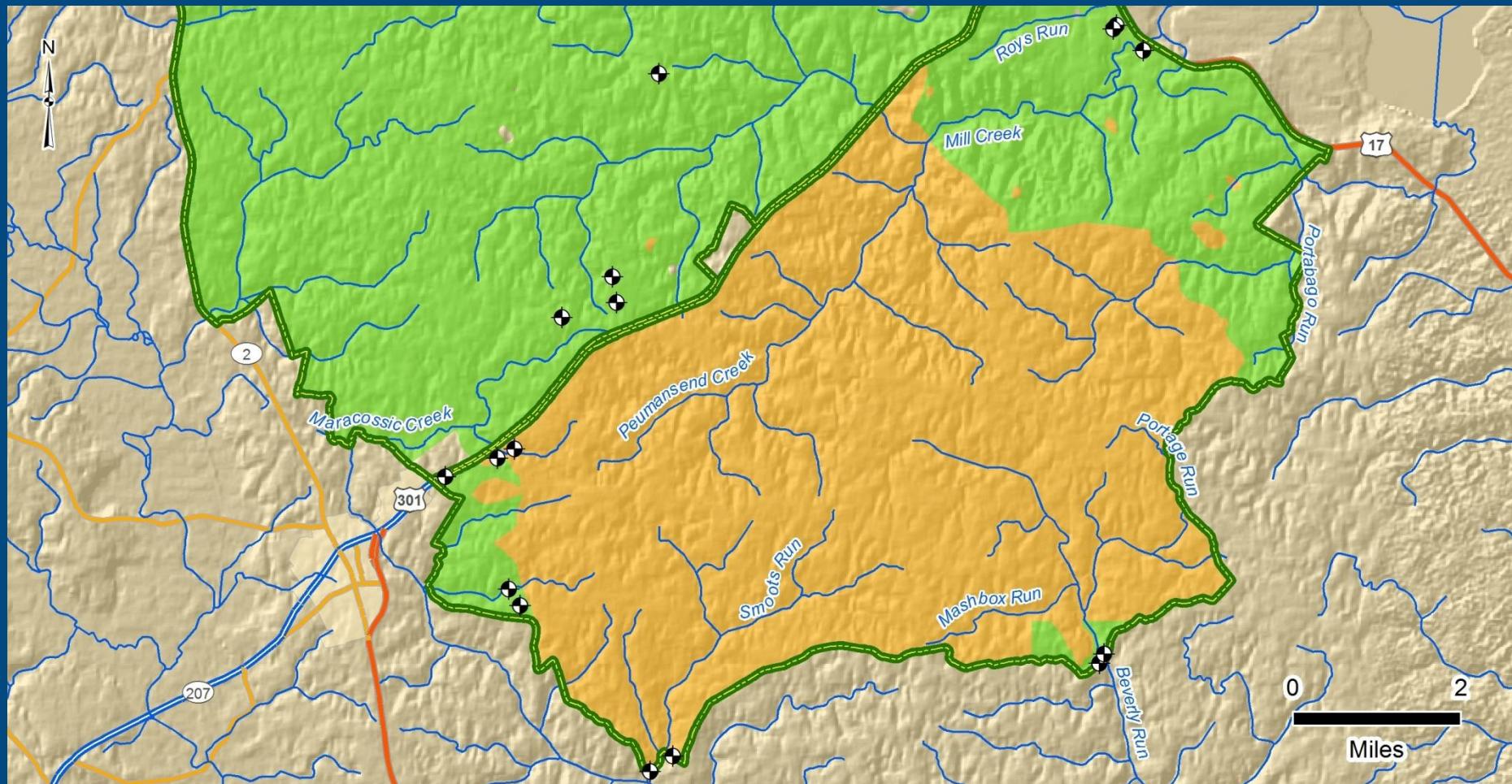
- Surficial aquifer wells at installation boundary designed to mimic potential receptor wells – 2 Wells per watershed
- Existing deeper production wells sampled to evaluate potential surfical to deep migration – 4 Wells



Surficial Aquifer Wells



Groundwater Approach



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Groundwater Results

All transportable analytes below background and/or human screening criteria at range/installation boundary in surficial aquifer and within the deeper production wells

Lithology indicated low hydraulic conductivity in surficial aquifer even near surface water bodies

Data evaluation complete – report development underway



Lessons Learned in Proving the Concept

- Application of Worst Case Scenario application
 - Similarities in models of source, pathway, and receptor between watersheds allowed for a focused approach
- Establishing a baseline for storm event sampling
 - Installation of rain gauges, transducers and barometers in multiple watersheds identified parameters necessary for true storm transport
- Comparison of multi-seasonal benthic sampling results
 - Multi-seasonal approach added value – very dry “dry” season
 - BMI habitat and SEM-AVS sediment analysis provided additional weight of evidence to support analytical data
- Benefits of USEPA Method 1638 - only method to achieve QL 3x below screening criteria at site specific hardness

